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Public Utility Districts and Payment for Watershed Services: Explaining Water Users' Willingness to Pay

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INTRODUCTION

Protecting Watersheds: Payment for Watershed Service Programs

State and federal regulations have effectively reduced many sources of pollution to our waterways, and have been especially effective at reducing point-source pollution, such as industrial pollutants from factory outfalls. However, non-point source pollution – generally carried into waterbodies via stormwater runoff – poses a greater regulatory challenge. The 2012 U.S. EPA National Summary of Impaired Waters classifies more than 41,000 waters as impaired (on the 303d list). The water quality of many of these waterways is negatively affected by polluted runoff from agricultural, industrial, commercial and residential land uses within watersheds. These land uses increase the amount of impervious surfaces within a watershed – thereby increasing the speed and volume of stormwater runoff – and also introduce contaminants to that runoff such as residual pesticides from agricultural lands, chemicals from industrial and commercial sites, and common household pollutants like oil and paint, washed from roads and driveways. In the U.S. land use, including where and what type of development is allowed within watersheds, is generally governed through local laws and regulations. Therefore, it is local and regional governments, including cities, counties and public water and utility districts that are most often responsible for enacting and implementing land use strategies to protect watershed health.

Traditionally, local governing agencies have attempted to use regulatory tools to achieve watershed protection goals. Such tools are often written and enforced through land use ordinances, general plan language and zoning codes. Examples of these regulations include ordinances that protect riparian areas through buffers or setbacks, general plan language that mandates Best Management Practices for stormwater runoff, and zoning that protects sensitive areas from development. While these regulations can be effective, their adoption, implementation and enforcement are often unsuccessful. The history of planning in the U.S. is littered with examples of cities and counties stymied in their efforts to protect natural resources due to public resistance to regulations that impose limits on the kinds of activities allowed on private lands (e.g. Hurley & Walker 2004; Eugene Register Guard, Oct. 25, 27, and Nov. 14, 2010; High Country News, Feb. 6, 2012).

In many cases this resistance is the result of financial concerns. For instance, farmers and ranchers have argued that stream zone regulations will undermine their ability to turn a profit with their crops or cattle. Residential and commercial property owners have argued that zoning restrictions that limit their ability to build on or subdivide their land will diminish its market value. These financial concerns often overlap with ideological beliefs. In the U.S. there is a strong association between constitutionally guaranteed freedoms and the right of an individual to use his property however he

wishes, even when a recognized public good is at risk. Regardless of the motivation, the result of such resistance means that there are large areas of sensitive watersheds on privately owned lands – sometimes managed in ways that protect the watershed, and sometimes not.

Payment for watershed service (PWS) programs are an example of a non-regulatory strategy for protecting watershed health. PWS programs, like other types of payment for ecosystem service (PES) programs, are market based. That is, the beneficial services provided by a healthy watershed such as flood control, water filtration, erosion control, recreation opportunities and fish and wildlife habitat are treated as a commodity that can be quantified and valued. PWS programs work by offering incentives (usually financial) to landowners in exchange for adopting land management and water use practices that protect watershed services. For instance, private landowners in a watershed may be compensated for agricultural or timber practices that protect riparian habitat, reduce non-point source pollution, or store flood waters. Landowners who choose to participate in such a program are often referred to as sellers, because through their protective or restorative actions, they are selling watershed services. Funding for watershed protection typically is generated by users of the watershed services (also called buyers or beneficiaries), though most PWS programs seek supplementary funding through private organizations or entities, or through public funding sources. Management of PWS programs – including collection and distribution of funding along with monitoring and enforcement of management activities – is often the responsibility of a program administrator (Majanen et al. 2011), such as a local government entity or collaborative set-up for the purpose of managing the program.

Over the last couple decades, and especially within the last ten years, interest and awareness of ecosystem service markets has increased. This trend is true both globally and nationally. In 2008 the federal government established an official office within the U.S. Department of Agriculture, the Office of Environmental Markets (OEM), with the specific purpose of catalyzing the development of markets for ecosystem services. A report by Ecosystem Marketplace (Stanton et. al 2010) identified 216 active PWS programs in 24 different countries globally and anticipated a tripling of PWS transactions by 2050. A recent count of PWS programs in the U.S. catalogued 32 existing programs (Majanen et al. 2011), and predicted the number of programs would increase as more pilot programs are vetted. These indicators all point in one direction: ecosystem service markets, including PWS programs, are poised to become a significant conservation strategy in the coming decades.

Explaining Water Users' Willingness to Pay

Though not all PWS programs depend exclusively on buyer support for funding, any PWS program that is truly market based will apply funds provided by water users for some portion of protective or restorative actions planned. Therefore, the success of a PWS program hinges to some degree on beneficiaries willingness to pay (WTP) an amount for the watershed services that generates the funding necessary for meaningful management actions to be implemented. But what predicts a user's willingness-to pay?

In 2011 Oregon State University (OSU) and the University of Oregon (UO) applied for and received federal funding to investigate how public water districts/utilities and corporations might

provide sufficient funding and incentives to help make payments for ecosystem services a viable additional source of revenue and employment for the long-term sustainability of small and medium-sized farms and rural communities, and to explore the feasibility of instituting these models at different scales (OSU & UO 2011). As part of the research project UO and OSU conducted a survey of Eugene Water and Electric Board (EWEB) public water district rate payers that included a question about how much EWEB customers would be willing to pay to protect the ecosystem services provided by their local watershed. In addition to being of interest to UO and OSU researchers the survey had a practical purpose: to assist EWEB with the establishment of a program for protecting the existing water quality of the McKenzie River, which is treated and distributed to nearly 200,000 individuals in Eugene and Springfield by EWEB (EWEB 2011). The following analysis uses the response data generated by this survey to examine the explanatory power of three respondent characteristics that prior research has found to be correlated with willingness to pay for environmental goods generally: income, intensity of use and political ideology, and one respondent characteristic that is not well-studied as a predictor of WTP: Sense of Place.

Economic models often focus on income and use as determinants of WTP and multiple contingent valuation studies have shown that there is usually a positive correlation between higher income and amount of WTP, and between use of an environmental good and WTP (Carson & Flores 2001). Political ideology, as a socio demographic variable, has also been well researched. Generally more liberal ideologies are associated with higher expressions of environmental concern, including a greater likelihood of being willing to pay. In contrast, sense of place has not been well studied as a characteristic for predicting WTP even though many conservation efforts assume developing a relationship with a place is important for encouraging positive environmental attitudes and behaviors. The Sierra Club, for instance, has made outdoor activities an integral part of their outreach practices based on the belief that people will protect places with which they have relationships. Such assumptions have a foundation in a wealth of literature that links natural landscapes to concepts of identity, solace and spirituality.

In this study we are particularly interested in the effects of “sense of place” on WTP when controlling for the traditional associations of higher income, more intense use, and liberal political ideologies, along with the socio-demographic control variables of: age, education and gender. We first evaluate the significance of each variable independently (controlling for the selected set of socio-demographic variables) and then compare the relative strength of each when analyzed in combination.

Standard economic models: Income and Use

Most research that explores willingness to pay is associated with contingent valuation (CV) surveys. Richard T. Carson, a professor and economist specializing in CV research, published a comprehensive bibliography of 7,500 contingent valuation studies in 2011. As a body of literature, this research offers enough data that there are now standard expectations for the influence of certain respondent characteristics on WTP for environmental goods (Carson & Flores 2001). That is, there is a certain amount of construct validity associated with willingness to pay surveys. Among those variables with strong construct validity are income and use.

Basic economic theory holds that as the price of a good increases, the willingness of people to pay the price for the good will decrease. According to this theory there is a limit to the monetary price people are willing or able to pay for any good. Income – as a representation of the funding an individual has available should, therefore, be positively correlated with WTP – the higher your income, the greater amount of money you are anticipated to be willing to pay. In addition to being a principle consistent with economic theory generally, this correlation has held up in multiple WTP surveys (Carson & Flores 2001).

Intensity of use also has a positive correlation with WTP. In CV research regarding environmental goods, use is generally divided into two categories: direct use and passive use. Direct use means an individual visits or experiences the good in question (e.g. takes walks in the meadow, or drinks the water) whereas passive use refers to simply knowing the good exists, even if it is never actually experienced (e.g. knowledge that the meadow exists, knowledge that the water is clean). In general, those with passive use values are expected to be willing to pay less than those with direct use values (Carson & Flores, 2001). Similarly, those direct users who are intensive users (who use the good frequently) are anticipated to be willing to pay more than infrequent users. In our study, all survey respondents are consumers of water from the McKenzie River, and so there is a baseline established: everyone is a direct user. However, because enacting measures to protect the water quality of the McKenzie River has an impact to the land within the watershed we considered a “user” to be a respondent that visited the watershed for some activity at least once a year. We measured intensity of use by asking how frequently the respondent visited the watershed.

Political Ideology

Political ideology is also a consistently significant predictor of environmental concern (Dunlap, 1975; Francken 1986; Samdahl & Robinson 1989; Jones & Dunlap 1992; Ivanova & Tranter, 2004; Neumayer 2004; Curry et al. 2007; Li et al 2009;). Examining the relationship between political ideology and WTP has been a focus of research regarding environmental attitudes since the 1970s. Several of the first studies on the subject were aimed at discovering whether concern for the environment was a bi-partisan sentiment. These studies found that it did seem to be a politically cross cutting issue, especially when measuring conservative and liberal ideologies by way of political party identification (Dillman & Christensen 1972; Buttel & Flinn 1978, Lowe & Pinhey, 1982; Honnold 1981). By the later 1970s, however, studies exploring the relationship between politics and environmental attitudes were beginning to show political correlations. In general, the more liberal an individual’s ideology – the more likely they were to support programs for environmental protection. This relationship has become more pronounced over time. Research from the last decade shows that those who identify with more liberal ideologies are at least slightly more WTP for environmental protection than those who identify with more conservative ideologies (Ivanova & Tranter 2004; Neumayer 2004; Curry et al. 2007; Li et al 2009; Bateman & Dupont 2010). Resource managers familiar with this trend would rationally assume that in areas where “politically conservative” describes the demographic of the potential service buyers, generating the necessary support and funding for a successful program would be more difficult.

Sense of Place

While there is significant literature on both the psychology of place and what comprises “sense of place” there is little research into sense of place as an explanatory variable for human behavior (Jorgensen & Stedman 2001; Tucker et al. 2006). Indeed, place meaning and experience is often overlooked as an aspect of planning, despite that fact that place based research shows that place value influences behavior (Manzo & Perkins 2006).

Sense of place may be an especially important predictor of a beneficiaries’ WTP for watershed protection because protecting watershed services directly corresponds to protecting a geographic area, and often a local one. That is, PWS schemes generally propose that those who benefit from a healthy watershed (the buyers) should be those that pay for the watershed’s restoration, conservation and stewardship. Because the watershed action that the buyer is paying for affects a specific location, the buyer often has access to the program’s landscape benefits. In other words, a PWS scheme is place based. This context differentiates PWS from other payment for ecosystem service programs such as carbon markets or markets for the conservation of biodiversity – both of which tend to be national or international in scale. It also differentiates it from predictive WTP studies that focus on an individual’s personal environmental behavior, such as whether the individual recycles or conserves energy in their home. Finally, it differentiates it from WTP studies that examine consumer preferences, which are linked to products, not places.

In this study we define sense of place as the meaning and value people have with landscapes. An emerging literature on sense of place describes sense of place as a construct comprised of place attachment, place dependence and place identity (Jorgensen & Stedman 2001; Jorgensen & Stedman, 2006; Tucker et al. 2006; Nielsen-Pincus et al. 2010), and these are the three components we use to construct “sense of place” in our study. Consistent with the descriptions reflected by Jorgensen and Stedman in their 2001 analysis and used by Nielsen-Pincus (2010), we consider place attachment to be the emotional bond between a person and a particular place (Altman & Low, 1992); place identity an individual’s belief about the degree to which place is reflected in the self (Jorgensen & Stedman 2001); and place dependence the degree to which place facilitates some set of objectives for an individual when compared to alternative settings (Williams & Vaske 2003).

We hypothesize that individuals who have a strong sense of place associated with the McKenzie River watershed will be more WTP than those with a weaker sense of place when controlling for the anticipated effects of income, use, and political ideology and the selected socio-demographic variables. This hypothesis is consistent with the findings of a study sponsored by the Australian government that found those who are more likely to undertake river protective behaviors have a strong sense of place composed of place identity, attachment and dependence (Tucker et al. 2006).

Socio-demographic Control Variables: age, education and gender

Much like income and use, age has strong construct validity related to WTP. Age has consistently been shown to have an inverse correlation to WTP: the older you are the less you are willing to pay (Carson & Flores 2001; Dietz, Stern & Guagnano 1998). Education has a less consistent relationship with

WTP but generally there is a positive association between years of education and demonstrating environmental concern – though many studies have found this correlation to be weak (e.g. Dietz, Stern & Guagnano 1998). Women are consistently more likely than men to have to express concern for the environment, and to be more WTP for environmental protections. This association is consistent enough that many researchers have examined underlying explanations for the relationship. Stern & Guagnano (1998) provide a brief review of some of these studies in the literature review of their article “Social Structural and Social Psychological Bases of Environmental Concern.”

METHODS

Study Area

The geographic location of our study was the City of Eugene, Oregon and the adjacent McKenzie River watershed. The McKenzie River watershed encompasses 1,380 square miles of land in central Oregon and stretches from the Willamette Valley into the Cascades. The watershed contains many small rivers, creeks, streams and springs – all of which drain into the 90-mile McKenzie River, the sole source of drinking water to more than 87,000 businesses, schools, homes and other customers in the Eugene and Springfield urban area served by EWEB (EWEB 2011). Land uses in the McKenzie watershed include: agricultural use – 34,000 acres; residential use – 9,000 acres; and industrial use – 1,000 acres. The agricultural, residential and industrial land uses are primarily in the alluvial areas of the watershed. The majority of the remaining 800,000 acres is in forest uses, including private and public land and wilderness areas in the watersheds’ upper reaches (OSU 2007). Agricultural uses include orchards, nurseries, row crops and pasturelands (EWEB 2011a). EWEB’s drinking water intake, located at river mile 11 (heading east from its confluence with the Willamette River) is within the Springfield city limits. The combined population of the cities of Springfield and Eugene, both of which are adjacent to the watershed and served by EWEB, is approximately 350,000 (U.S. Census 2010).

Data Collection and Sampling

Our survey sample was pulled from the population of EWEB residential rate-payers in the City of Eugene. Of an estimated 50,000 residential water rate-payers in the City, we surveyed a stratified random sample of 1,000 individuals. Approximately 30 percent of our sample received emails with a link to an online survey while the rest of the sample received a survey via USPS mail. Our USPS mail survey instrument was a 12-page, black and white, printed booklet that consisted of 31 questions, about half of which were multi-item questions with Likert-type responses. Total responses possible within the survey were 165. The online survey was a replica of the hard copy survey administered through the online research software, Qualtrics.

We stratified our sample by U.S. Census Tract and income categories by grouping Census Tracts within Eugene City limits into income quintiles (five categories). From each quintile we randomly selected approximately 200 people for a total sample of 1,000 residential water rate payers. To mitigate for anticipated survey response bias we oversampled slightly within the two lowest Census Tract income quintiles and undersampled slightly within the higher income census tract quintiles. (We anticipated

higher response rates from higher income individuals consistent with prior survey research). Table 1 describes the number of surveys issued and the approximate response rates from each Census Tract income quintile. Of the 1,000 surveys issued, 10 were returned by the post office due to a mailing address error and two registered as email errors. Therefore our final adjusted sample was 988. Of these 988 surveys issued, 414 individuals responded. EWEB offered a \$10 credit for all those individuals who filled out and submitted the survey. A copy of the survey instrument is provided in Appendix A.

Table 1: Survey's issued by Census Income Tract Quintile

Income Quintile	Survey's issued	Survey's completed	Total Response Rate %
1	250	107 (43%)	26%
2	250	94 (37%)	24%
3	175	64 (36%)	15%
4	175	76 (44%)	18%
5	150	70 (47%)	17%
TOTAL	1000	414	100%

DATA ANALYSIS AND DESCRIPTIVE RESULTS

Dependent Variables: In-Principle WTP and Amount of WTP

We analyzed two dependent variables: “in-principle WTP” and “amount of WTP” (given that you are a willing payer). Both variables were derived from the same WTP question. The question asked respondents whether they would be willing to pay an additional fee on their monthly water bill to fund water quality improvement projects within the McKenzie River corridor. The potential additional fee included the following price levels: \$0.50, \$1.00, \$3.00, \$5.00, \$10.00. For each price level respondents selected one of five items in a Likert-type response scale scored as: 2=definitely yes, 1= probably yes, 0=unsure, -1=probably no, or -2=definitely no. To measure in-principle WTP, responses were collapsed into a binary variable where any respondent who indicated a 2 for any amount (indicating definitely WTP) was determined to be a respondent that was in-principle WTP (WTP=1), and all other respondents were determined unwilling to pay (WTP=0). Of the 399 surveys analyzed, 201 were in-principle WTP and 198 were not (probability of being WTP = 50.3 percent). We use Logit models to analyze the effect of independent variables on in-principle WTP.

To measure “amount of WTP” we included all those respondents who were willing payers (who expressed in-principle WTP) and assumed that the highest price level an individual was willing to pay meant the individual would be willing to pay at all price levels below that as well. For instance, a respondent who said they were definitely willing to pay \$5.00 was also assumed to be definitely willing to pay \$3.00, \$1.00 and \$0.50.

The mean amount of WTP over all respondents was \$1.07 per person per month (with a minimum of \$0.00, a maximum of \$10.00 and a standard deviation of 1.94). In the subgroup of all in-principle WTP respondents the mean was \$2.12 per person per month (with a minimum \$0.50, a

maximum \$10.00 and a standard deviation of \$2.32). We used a Sequential Logistic Regression to evaluate the effect of the independent variables on amount of WTP.

Missing variables

Of the 414 surveys received, 15 respondents answered no more than two of the 165 responses possible. We dropped these 15 individuals from our analysis. Of the remaining 399 surveys, the average number of missing responses was nine with a range from 0 to 158 missing responses and a standard deviation of 24. Seventy eight percent of the 399 respondents missed five or fewer response. To manage missing responses we employed a list wise deletion strategy. This means we excluded individuals who had missed responses to any one of the variables we were analyzing. For instance, when examining the effects of income on the willingness of respondents to pay \$0.50 we excluded all those individuals who had missed responding to the question regarding household income. There are two exceptions to this approach. 1) When tabulating responses for activities in the watershed we re-coded all missing responses as “0” rather than drop respondents because many people had left several activity columns blank. We think this may have had to do with respondents scanning response columns and finding that they do not ever go swimming in the watershed, for instance, and so, instead of taking the time to check the “never” bubble, they simple left that activity blank. 2) When creating a binary variable for “definitely willing to pay” respondents who did not respond to any of the payment categories at any price were lumped with those respondents who had selected less than “definitely willing to pay” for all of the payment categories.

Independent Variables

The independent variables income, use, frequency of use, political ideology, and sense of place were measured as follows:

Income was measured by asking respondents to select one of five categories that described their household income in 2011 before taxes. Response categories were: less than \$25,000; \$25,000-\$49,999; \$50,000-\$74,999; \$75,000-\$99,999; \$100,000 or more. These responses were coded as: 0= less than \$25,000; 1=\$25,000-\$49,999; 2=\$50,000-\$74,999; 3=\$75,000-\$99,999; 4=\$100,000 or more. Of the 347 people who answered the income question, responses were tabulated as described in Table 2. As the table describes, income responses were distributed somewhat evenly across the five categories.

Table 2: Survey respondents by income categories

Income	Number of people	Percent %
less than \$25,000	65	18.7
\$25,000 - \$49,999	89	25.6
\$50,000 - \$74,999	79	22.7
\$75,000 - \$99,999	47	13.5
\$100,000 or more	67	19.3

Use was determined by asking respondents how often they visited the McKenzie River Watershed in an average year. To prompt responses 16 categories of activities were provided describing

activities such as hiking, camping, swimming, hunting, working etc... For each activity respondents chose the frequency with which they engaged in the activity in the watershed according to the following six options: once a week; once a month; once every 3-4 months; once every 6 months; once a year; or never. Respondents were treated as either “users” – anyone who visited the watershed for any activity at least once a year and “non-users” those who indicated they engaged in none of the activities at any frequency within a year. Responses were coded: 1=user and 0=non-user. There were 315 users (79%) and 84 non-users.

Frequency of Use was measured by converting responses for each activity to a quantitative scale where once a week=52; once a month=12; once every 3-4 months=3.5; once every 6 months=2; once a year =1 and never=0. To summarize intensity of use for each respondent we added the values for each of the 16 activities. Intensity of use scores ranged from 0 to 156. The mean user frequency was 9.48 with a standard deviation of 15.76. Due to a left skewed distribution (most users frequent the watershed only occasionally), we used the natural logarithm of user frequency as our independent variable. Because the natural logarithm of 0 is 1 all those respondents who were non-users were identified as once-a-year users in our natural log dataset. To manage this distortion in our regression models we included non-users as a variable whenever we modeled user frequency in a regression analysis. Generally we found the difference between non-users and once-per-year users was unsubstantial and insignificant (see Table 5 Model B). (A Chi-square test revealed that 44 percent of the 27 respondents who were once-per-year users were willing to pay while 40 percent of the 84 respondents who were non-users were willing to pay.)

Political ideology was determined by asking respondents whether they considered their political attitudes to be more conservative or liberal in nature according to the following Likert-type scale: very conservative; somewhat conservative; neither conservative or liberal; somewhat liberal; very liberal. We turned these Likert responses into quantitative scores with the dummy variables. 2=very liberal, 1=liberal, 0=neither conservative nor liberal -1= conservative, -2=very conservative. Of the 373 respondents who answered the question regarding their political ideology 178 said they were liberal or very liberal, 88 chose neither, and 107 said they were conservative or very conservative. In addition to this quantitative scale, we also created binary variables with each of these categories: liberal vs. not; conservative vs. not, and neither liberal or conservative vs. liberal or conservative.

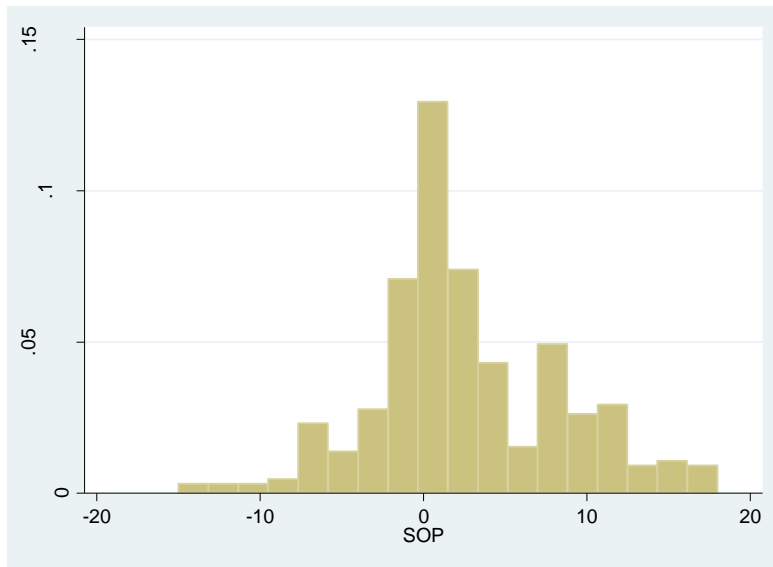
“Sense of place” was determined through a nine item question (Table 3) measuring place attachment, place identity and place dependence. The table was created with reference to previous sense of place research (especially Nielsen-Pincus 2010 referencing Jorgensen & Stedman, 2001 and Williams & Vaske, 2003). Respondents were asked how much they agreed or disagreed with statements about the McKenzie River Watershed. For each statement respondents chose a five item Likert-type response scale ranging from strongly agree to strongly disagree. The midpoint of the scale was an “unsure” response. Three of the statements measured place attachment, three statements place dependence, and three place identity. Three of the statements were negatively worded and the rest positively worded. Responses were coded as -2=strongly disagree; -1=disagree; 0=unsure; 1=agree; 2=strongly agree. (Negatively worded responses were reverse coded). To create a sense of place score

for each individual we added the responses to each of the nine questions together. Sense of place scores ranged from -15 to 18. The mean score was 2.47 with a standard deviation of 5.8.

Table 3: Items used to construct sense of place

Item Description: How much do you agree or disagree with the following statements about the importance of the McKenzie River Watershed to you personally? (Select one response for each statement)	
Statement	Hypothesized factor
It is my favorite place to be	ATT 1
I really miss it when I am away for too long	ATT 2
I feel happiest when I am there	ATT 3
It reflects the type of person I am	ID 1
I feel I can really be myself when I'm there	ID 2
I don't really identify with the McKenzie River Watershed	ID 3
As far as I'm concerned there are better places to be	DEP 1
It is the best place for me to do the outdoor things I enjoy	DEP 2
I would enjoy the activities I undertake there just as well in another place	DEP 3

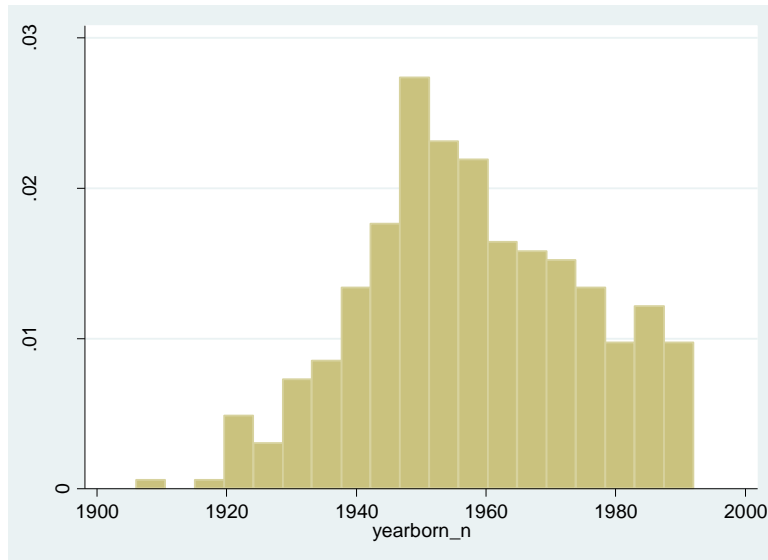
Histogram of sense of place scores among respondents



Control Variables. To determine respondent age we asked respondents to write in the year they were born. Gender was determined through a binary male or female question. To determine education status we asked respondents which of the following categories described their highest level of school completed: 0) less than HS 1) HS or equivalent 2) some college no degree 3) Associate's Degree 4) college degree (BA/BS) 5) graduate or professional degree.

The average respondent was born in 1958, and therefore was around 54 years of age. The youngest respondent was 20 and the oldest was 106. Forty five percent of respondents were female. The median response for the education question was college degree. The average respondent had an Associate's Degree.

Histogram of year born responses



MULTIVARIATE RESULTS

In-Principle Willingness to Pay

Table 5 describes the odds ratios of the multivariate analysis for in-principle WTP applying a Logit model. Models A through E describe each of independent variables in question (Income, Use, User Frequency, Political Ideology and Sense of Place) separately. Model F includes all explanatory determinants. All models control for gender, age and education.

As shown in Model A of Table 5, income does not have a significant effect on the odds of being in-principle willing to pay. Model B shows that frequency of use has a substantial and positive effect on in-principle WTP (odds ratio=1.24) indicating that a 1 percent increase in an individual's use of the watershed is associated with about a 24% increase in the odds of an individual being WTP, though the coefficient is not quite significant at the 0.5 level ($p=0.072$). Model C includes use and income, the two determinants of the basic economic model. In this model only user frequency has a value bordering on significant. Overall the basic economic model, Model C, explains some variation among respondents' in-principle willingness to pay, Pseudo- $R^2 = 0.0681$.

Political ideology (Model D) has a more substantial and very significant effect on in-principle WTP: odds ratio coefficient = 1.53 ($p=0.00$). The model describes the anticipated finding that the more liberal an individual the more likely the person is to be in-principle WTP. The explanatory power provided by Model D is slightly higher than that provided by the basic economic model. Pseudo- $R^2 = 0.0897$.

To better explain the relationship between a more liberal ideology and in-principle WTP we also ran this same Logit model with the binary variable "liberal" (liberal=1 and 0=other), in place of "political ideology." The odds ratio generated by this model was 2.83. Therefore, the model predicts that an

individual who identifies as liberal is nearly three times more likely to be willing to pay than an individual who does not. Conversely, running the same model with the binary variable “conservative” substituted for “political ideology” (conservative=1 and 0=other) predicts that being conservative decrease the odds of an individual being willing to pay by about 45 percent (odds ratio = . 455). Table 4 shows a basic percent comparison between WTP and political ideology.

Table 4: Political Ideology and WTP by percent

WTP	Political Ideology		
	Conservative	Liberal	Other
Yes	35%	69%	44%
No	65%	31%	56%
Total	100%	100%	100%

Model E indicates that sense of place has a positive and significant effect on WTP. The model’s odds ratio coefficient of 1.103 predicts that every 1 point increase in an individual’s sense of place score (on a scale of 33) is associated with about a 10 percent increase in the odds of an individual being willing to pay in-principle. Model E has more explanatory power than either Model C or D. Pseudo $R^2 = 0.1024$.

Model F presents the odd ratios associated with all proposed determinants of willingness to pay in a single model. Income remains an insignificant effect, and the explanatory power of frequency of use falls to a level of insignificance. Both political ideology and sense of place maintain a substantial and significant effect. Importantly Model F shows, as we hypothesized, that sense of place, even when controlling for political ideology, has a positive effect on in-principle WTP. In this model, every 1 point increase in an individual’s sense of place increases their likelihood of being in-principle WTP by about 8 percent, while every one step up in our five category political scale is associated with a 53 percent increase in in-principle WTP. The explanatory power of Model F is modest: Pseudo $R^2 = 0.1321$.

The reduction in significance associated with user frequency in Model F is due to a moderate correlation between user frequency and sense of place. A factor analysis run on these variables shows that user frequency and sense of place do load together, however, a correlation analysis shows their correlation is not substantial: 1 to .46. The results of Model F indicate that even those who are non-users or who frequent the McKenzie only rarely may still have a strong sense of place. This is consistent with literature on the sense of place construct which, as described earlier, shows that sense of place is determined by more than frequent use of a landscape.

The odds ratios displayed in Model F do not tell us whether political ideology or sense of place that are the most influential on WTP. This is because the scales of their measurement are different. Political ideology is a five point scale (very conservative to very liberal) while sense of place is scored on a scale of 33 points (range -15 to 18). In order to compare the influence of these two variables we generated partial correlation coefficients. The partial correlation for sense of place (sense of place log odds coefficient from Model F multiplied by sense of place standard deviation: 0.083×5.8) was 0.48. The partial correlation coefficient for political ideology using the same methodology was 0.51. Therefore,

while the influence of political ideology is slightly greater than that of sense of place on an individual's in-principle WTP, both variables have similar explanatory power.

The control variables behaved as anticipated in all of the models, and with a high degree of confidence (mostly 95 percent confidence or better). Younger individuals have slightly better odds of being willing to pay than older individuals. For every one year increase in age the odds of an individual being in-principle WTP decline by a little more than 1 percent. Education has a positive effect on WTP in all models, though it loses its significance in Model F. All the models show, with a 99.9 percent degree of confidence, that women have better odds of being willing to pay in-principle than men. The odds of any man being willing to pay in-principle are about 47 percent less than that of any one woman.

Table 5: Multivariate Results – In-Principle Willingness to Pay (1=Willing to Pay)

Multivariate Results - In Principle Willingness to Pay						
Variable	Odds Ratios - Logit Models (1= Willing to Pay)					
	A	B	C	D	E	F
Income	0.897 (-1.16)		0.88 (-1.33)			1.027 (0.25)
Nonuser		0.924 (-0.22)	0.931 (-0.20)			0.831 (-0.45)
Natural log User Frequency		1.24 (1.80)#	1.24 (1.79)#			1.015 (0.10)
Political				1.53 (4.17)***		1.53 (3.64)***
SOP					1.103 (4.48)***	1.087 (3.02)**
Gender (Men=1)	0.472 (-3.23)**	0.44 (-3.65)***	0.458 (-3.32)**	0.518 (-2.87)**	0.422 (-3.56)***	0.467 (-2.91)**
Education	1.29 (2.77)**	1.231 (2.63)**	1.27 (2.57)*	1.153 (1.72)#	1.219 (2.31)*	1.092 (0.81)
Year Born	1.015 (2.21)*	1.010 (1.58)	1.01 (1.87)#	1.010 (1.50)	1.019 (2.67)**	1.020 (2.51)*
pseduo r ²	0.0549	0.0647	0.0681	0.0897	0.1024	0.1321
Chi-Square	0	0	0	0	0	0
n	332	361	332	357	326	300

note: z values are in parentheses

p < 0.10, *P < 0.05, ** P < 0.01, ***P < 0.001

Amount of Willingness to Pay

Of the 399 respondents, 201 indicated they were willing to pay at least \$0.50 per month. As previously described, we assumed the highest price level an individual was willing to pay meant the individual would be willing to pay at all price levels below that as well. Table 5 shows the distribution of these 201 respondents by payment category: 201 people would be willing to pay at least \$0.50 per month, 155 people to pay at least \$1.00 per month, 65 people to pay at least \$3.00 per month, 34 people at least \$5.00 per month, and 10 people at least \$10.00 per month. There is a drop in willingness to pay between the price categories of \$1.00 and \$3.00. While 155 of the 201 individuals (77 percent) are willing to pay at least \$1.00 per month, only 65 of the 201 individuals (32 percent) are WTP at least \$3.00 per month.

Table 6: WTP by payment categories (from a total of 201 willing payers)

WTP amount	observations
\$0.50	201
\$1.00	155
\$3.00	65
\$5.00	34
\$10.00	10

Many studies related to WTP are able to use price as a continuous quantitative dependent variable and therefore apply OLS regression to analyze the effects of independent variables. However, because our study asked respondents their willingness to pay at each of five price categories, treating our WTP variable as a quantitative continuous variable does not accurately represent the data we gathered. A Sequential Logistic Regression model allows us to compare the effects of independent variables with the least amount of data distortion. The downside of this approach is that there are less people WTP at higher pay categories. This shrinks the number of observations available for analysis at the higher end of the pay scale.

Table 7 displays the results of our multivariate Sequential Logistic Regression analysis. This analysis limits the analysis at each step (each sequential model) to those individuals who said yes to the WTP amount in the previous model. For instance, Model B in Table 7 compares all those respondents who are WTP at least \$1.00 with all those respondents who are willing to pay no more than \$0.50. Model C compares all those respondents who are WTP at least \$3.00 with all those respondents who are willing to pay no more than \$1.00. Model D compares all those respondents who are WTP at least \$5.00 with all those respondents who are willing to pay no more than \$3.00. Model E compares all those respondents who are WTP at least \$10.00 with all those respondents who are willing to pay no more than \$05.00. Because there is no numeric amount below \$0.50 to say “definitely yes” to, Model A in the table compares all respondents willing to pay at least \$0.50 per month with all respondents who are not willing to pay at any suggested price category. Therefore the results of this model are exactly the same as our multivariate analysis of in-principle WTP (Table 5 Model F).

One noticeable difference between Model B and Model A is that the regression coefficient for income increases and also moves closer to being a significant effect. It increases again, both in substance and significance in Model C. This effect is consistent with the literature (positive correlation between income and amount of WTP), even though it never reaches significance at the 5 percent level.

Another noticeable difference is the behavior of the non-user variable. In Model A those who are WTP \$0.50 and never visit the watershed show no significant difference from those that are WTP \$0.50 and visit it one or more times. And this is true in Model B as well. However, in Model C, the coefficient for non-user jumps substantially and its significance also increases. Though significance is not reached at the 5 percent level Model C trends toward the conclusion that more people who indicated they were willing to pay at least \$3.00 are less likely to have visited the watershed than those who said they would not be willing to pay \$3.00 or more. This is inconsistent with expectations and with the literature – however given the insignificance of the effect it may only be worth noting that as the proposed price category increases, the model displays less explanatory power with respect to the predicted effect of the independent variables.

Political Ideology maintains a similar influence in Models A, B and C, though the level of confidence with which we can rely on it as a predictor drops steadily and is not significant at the 5 percent level until Model E. Sense of place also loses confidence as a predictor dropping below a 5 percent level of significance in all of the models except for A. However, the sense of place odds ratios indicate sense of place trends have a positive effect on WTP in all the models excepting Model D.

Interestingly, gender as a control variable shows a different trend in Models B through E than it does in Model A. Though the odds ratio is not significant in any of the models except A, the trend indicates that men have improved odds of paying higher amounts than women. So, while women may be more willing to pay in-principle, there is an indication that among those men and women who are willing to pay, men will be willing to pay more. Education maintains a positively trending effect among all models, though its coefficient never reaches a 5 percent level of significance. Age also does not have a significant effect but trends toward younger people being willing to pay more, with the exception of Model E.

Overall, the significance of all independent variables drops below the 95 percent level of explanatory confidence in Model C, and continues dropping in Model D. This overall decline in significance is reflected in the Pseudo R^2 for the models which also declines steadily from Model A (0.1321) to Model D (0.0391). The independent variables simply do not offer an explanation as to why a person who would be willing to pay \$1.00 per month is not willing to pay more \$3.00 per month, or why a person who is willing to pay \$3.00 per month is not willing to pay \$5.00 per month. In other words, we cannot say with a lot of confidence what characteristics differentiate individuals in each price category.

Some of the loss of explanatory power for most of the independent variables in Models B, C, D and E can probably be attributed to the reduction in number of observations. However, there are enough observations, from 166 in Model B, to 24 in Model E, that the decline in significance of the

independent variables should not be attributed solely to this factor. It may also be the case that the independent variables selected for our models are not those that explain amount of WTP.

The most interesting exception to this finding is the effect of political ideology in Model E. Here we see a very high odds ratio, 10.78, at a 5 percent level of significance. Though none of the other independent variables have a significant effect on WTP \$10.00, the substantial effect of political ideology is enough to bring the Pseudo R^2 in Model E to .41. This result indicates, with a 95 percent degree of confidence, that the odds an individual who is willing to pay \$10.00 identifies as liberal are significantly better than the odds an individual who is willing to pay up to \$5.00 identifies as liberal.

A Chi-Square test reveals that of the 10 people who said they would be willing to pay at least \$10.00, six identified as very liberal, three identified as liberal and one identified as either liberal or conservative. In contrast, the distribution of political categories among those people who said they would be willing to pay \$3.00 and up to \$5.00 is more spread out: six people who identified as conservative indicate a willingness to pay \$5.00 and seven people who identified as neither conservative nor liberal indicated a willingness to pay \$5.00.

Also worth noting is that of the 10 people who indicated they would be willing to pay at the \$10.00 level, all have frequented the McKenzie at least once in the past year, which is why the non-user variable is omitted. However the average frequency with which these 10 visited was approximately twice a year (2.2), less than the average for the entire population, which was 9.48. The average sense of place score for these payers also had a wide range, from -8 to 12, and averaged 4.3, (slightly higher than the average for the total survey population).

Table 7: Multivariate Results - Amount of WTP displayed through Sequential Logistic Regression models

Multivariate Results - Amount WTP					
Variable	Odds Ratios - Logit Models: (1= Willing to Pay)				
	A	B	C	D	E
	WTP >= \$0.50	WTP \$0.50 and >= \$1.00	WTP \$1.00 and >= \$3.00	WTP \$3.00 and >= \$5.00	WTP \$5.00 and >= \$10.00
Income	1.027 (0.25)	1.233 (1.17)	1.293 (1.51)	0.808 (-0.82)	1.15 (0.28)
Nonuser	0.831 (-0.45)	0.481 (-1.10)	2.69 (1.44)	1.25 (0.21)	omitted
Natural log User Frequency	1.015 (0.10)	0.666 (-1.61)	0.910 (-0.38)	0.94 (-0.16)	0.523 (-0.77)
Political Ideology	1.53 (3.64)***	1.456 (2.15)*	1.10 (0.53)	1.053 (0.16)	10.78 (1.96)*
SOP	1.087 (3.02)**	1.064 (1.49)	1.06 (1.34)	0.999 (-0.02)	1.11 (0.68)
Gender (Men=1)	0.467 (-2.91)**	1.723 (1.37)	1.46 (0.99)	1.85 (1.03)	1.196 (0.13)
Education	1.092 (0.81)	1.327 (1.75)#	1.22 (1.10)	1.24 (0.76)	2.353 (1.35)
Year Born	1.020 (2.51)*	1.00 (0.49)	1.011 (0.83)	1.015 (0.64)	0.966 (-0.60)
pseduo r ²	0.1321	0.113	0.0626	0.0391	0.4093
Chi-Square	0	0.0066	0.2238	0.9403	0.0722
n	300	166	124	54	24

note: z values are in parentheses

p < 0.10, *P < 0.05, ** P < 0.01, ***P < 0.001

DISCUSSION

The most interesting finding from this study is that sense of place has an effect on the in-principle willingness of a water district residential customer to pay even when controlling for the substantial and significant effects of political ideology, gender, education and age. From a policy perspective this result is important because it warns policy makers who are using political ideology as a litmus test for whether a PWS program would be supported in their jurisdiction that the political demographic of the population may not be the best or most important indicator of support.

Furthermore, our findings indicate that while there is a correlation between sense of place and use of the watershed landscape (for recreation or other purposes), use of the resource is not the strongest and certainly not the only predictor of whether an individual may have a strong sense of place. This is consistent with prior sense of place research that shows sense of place is a construct created by a combination of: the emotional bond a person has with a place (place attachment), the degree to which a place facilitated some set of objectives compared with an alternative setting (place dependence), and an individual's belief about the degree to which a place reflects who they are (place identity). That is, a person who never visits the McKenzie River watershed may still strongly identify with it, and this identification has an effect on their "sense of place" score.

That sense of place plays an important role in WTP is consistent with similar studies regarding the effects of sense of place on environmental behavior and environmental concern. For instance, Vorkinn and Riese (2001) found that place attachment was the strongest predictor of environmental concern for a local area among several other socio-demographic variables. Tucker et al. (2006) found that people who have a strong sense of place were more likely to take action to protect their local watershed, the Hawkesbury-Nepean River system in Australia. Kyle et al. (2003, 2004) found that place identity was positively associated with support for specific natural resource policies such as user fees and a variety of attitudes about conditions along the Appalachian Trail.

Our results also indicate that the characteristics that predict in-principle WTP may differ from those that predict amount of willingness to pay. With some exceptions (the increasing effect of income from Model A to B to C and the effect of political ideology in Model E), the Sequential Logistic Regression models show that while socio-demographic characteristics lend themselves to predicting in-principle WTP, they generally fail to predict amount of WTP. While this failure is not consistent with other literature focused on explaining amount of WTP, the findings that what predicts in-principle WTP is different than what predicts amount of WTP is consistent with a recent study by Liebe et al. (2011). This study found that several of the respondent characteristics, including income, that influenced in-principle WTP were different from those that influenced amount of WTP (given the respondent expressed in-principle WTP).

A final important note is that the independent variables chosen for this analysis represent only some of the social and psychological theories associated with explaining WTP. The 2011 Liebe et al. study conclusively demonstrates there is value in comparing a variety of explanatory theories when

considering explanations for WTP.¹ If other social-psychological theory constructs were included as independent variables in our models we probably would have improved our ability to explain the variation among respondents WTP.

CONCLUSION

This study analyzed the effect of several socio-demographic variables, along with the effects of “user frequency” and “sense of place”, on the willingness of residential water users to pay for watershed protection. Consistent with prior research, we found that younger people are more likely to be willing to pay than older people, that women are more likely to be willing to pay than men, that education has a positive influence on WTP, that a liberal political ideology is correlated with WTP, and that the greater frequency with which a person uses a resource the greater the odds are that the person will be willing to pay to protect the resource. The study also provides evidence of a positive correlation between income and the amount a respondent would be willing to pay, which is in agreement with economic theory, though the survey instrument we used made this effect difficult to observe with a high degree of confidence.

With regards to the effect of sense of place on WTP for watershed protection, we found that sense of place matters. When controlling for all other characteristics as well as user frequency, our in-principle WTP model showed that every one point increase in an individual’s sense of place increases their likelihood of being in-principle WTP by slightly more than 8 percent. We found that sense of place is a better predictor of an individual’s being willing to pay than user intensity and explains WTP about as well as political ideology when controlling for income, age, gender and education. Furthermore, for those in our sample who identified as either conservative or who declined to identify as conservative or liberal, sense of place was the best predictor of whether they were willing to pay. Of the 46 individuals who identified as conservative and had sense of place scores at 1 or below, only 22 percent were WTP. This is compared to 47 individuals who identified as conservative and had sense of place scores above 0. Of these, 47 percent were willing to pay. Based on these results, policymakers considering a PWS program should evaluate the strength of the relationship payers have with the watershed in question at least as much as other demographic characteristics when trying to predict program support.

Based on our findings, we recommend PWS program administrators work to enhance or create a “sense of place” among buyers of a watershed’s services. We also recommend policymakers use place-based messages and marketing strategies when communicating with buyers about PWS programs. The field of environmental psychology includes a vast literature on sense of place, including how and why people develop a sense of place. This literature is an important place for research when crafting a PWS public awareness campaign.

¹ Liebe et al. 2011 study compares the effects of five well-known theories of WTP for environmental goods 1) basic economic theory 2) theory of public goods 3) theory of planned behavior 4) models of altruistic/moral behavior 5) Schwartz’s norm-activation model

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